



Newsletter

Volume 11, Number 4
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Director's Note

Dr. Clive Jones joined the staff of the Mary Flagler Cary Arboretum in 1980, and has extended his research in chemical ecology since the Institute was founded in 1983. His research on gypsy moths, the effects of environmental stress on plants, the snail/lichen/rock ecosystem in Israel's Negev Desert and, most recently, his collaborative study with other IES ecologists on the interactions among gypsy moths, deer ticks, oaks and small mammal populations have led to international recognition. In April, Dr. Jones was named a Guggenheim Fellow.

Ms. Kathleen Hogan, educational research and development specialist, joined the IES Education Program in 1985. She not only has played a major role in launching many of the Institute's ecology education programs for school children, but also conceived, developed and published an innovative elementary school science curriculum called Eco-Inquiry. The curriculum is now available to teachers across the country, and will contribute to the scientific literacy of the next generation.

The articles describing the recent achievements of these two individuals illustrate the far-ranging impact of our scientific staff.

The IES Newsletter is published by the Institute of Ecosystem Studies, Millbrook, New York. All newsletter correspondence should be addressed to the editor.

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Dr. Jones Named Guggenheim Fellow

The Committee of Selection for the John Simon Guggenheim Memorial Foundation has named Institute of Ecosystem Studies ecologist Dr. Clive G. Jones a 1994 Guggenheim Fellow. Of this year's 3,157 applicants, Dr. Jones was one of 147 artists, scientists, and scholars selected for fellowship awards totaling \$4,070,000.

Dr. Jones' one-year, \$28,000 Guggenheim Fellowship enables him to do research on the relationships between global environmental change and food quality. The biochemistry of plant tissues determines the quality of that plant as food. Any reduction in the food value of plants can alter food web structure, with possible effects reaching even to humans. Plants tend to be poor food when they contain high concentrations of certain chemical compounds called phenolics and low concentrations of proteins and amino acids. Dr. Jones is investigating the effects of environmental change — for example increases in carbon dioxide, temperature changes, ultraviolet radiation, drought, air pollution, soil acidification, and attack by exotic insects and pathogens — on the concentration of phenolic compounds in plants, and thus on their value as food.

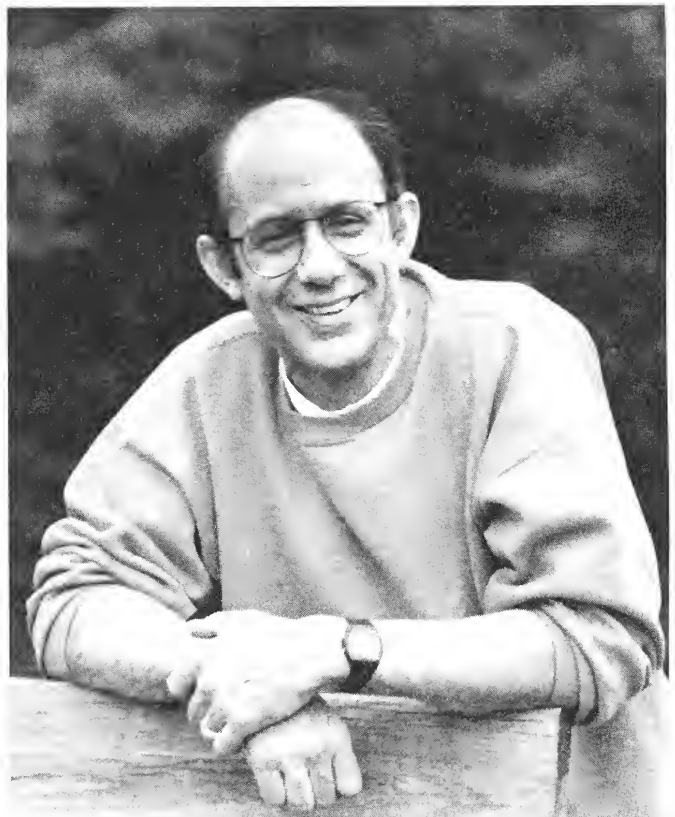
Dr. Jones' on-going research at the Institute is in the field of chemical ecology. His current projects include how plant defense mechanisms are affected by environmental stress; rock-eating snails and their impacts on desert soils; and interrelationships between small mammals, gypsy moth outbreaks, deer ticks, Lyme disease, and acorns.

The John Simon Guggenheim Memorial Foundation was established in 1925 by Mr. and Mrs. Simon Guggenheim in memory of their son. Simon Guggenheim was U.S. Senator from Colorado from 1907-1913; his father, Meyer Guggenheim, was a dominant force in the U.S. mining industry at the turn of the century. The goal in establishing the foundation was to add to the educational, literary, artistic and scientific strengths of this country, and to promote better international understanding. During its 70 year history, according to

Guggenheim Foundation President Mr. Joel Conarroe, the Foundation has granted over \$161 million in fellowships.

The Foundation grants funds to help Fellows secure a block of time, free from other duties, in which to pursue their own scholarly or creative work. Guggenheim Fellows are appointed on the basis of unusually distinguished achievement in the past and exceptional promise for future accomplishment. The list of 1994 Fellows includes poets, novelists, a playwright and a radio documentary artist, painters, sculptors, photographers, film and video makers, a choreographer, social scientists and scholars in the humanities, as well as physical and biological scientists such as Dr. Jones.

Dr. Jones, below, is doing a portion of his fellowship work in England this summer. At the Department of Animal and Plant Sciences, University of Sheffield, he is working with Professor F. Ian Woodward and colleagues who have been involved extensively in global environmental change research. He is also collaborating with IES adjunct scientist Professor John H. Lawton at the Centre for Population Biology, Imperial College at Silwood Park. Professor Lawton and colleagues have developed a controlled environment facility where Dr. Jones will run a "now versus future environment" experiment.



Eco-Inquiry Is Published



features classroom-tested lessons for three action-packed modules, each lasting from four to seven weeks. Teaching strategies and assessment tools are included as well. The appendices are an illustrated *Who Eats What* guide, with habitat and food source information on over 140 animals representative of the major geographic areas in the U.S., and lists of the materials required to do each module.

In spring 1986, Institute of Ecosystem Studies research and development specialist Ms. Kathleen Hogan (above) piloted a science curriculum of her own creation called Eco-Inquiry. The first schools to benefit were Millbrook's Alden Place Elementary School and Dutchess Day School. That fall, she added three elementary schools in Poughkeepsie and Beacon to the group, and modified the curriculum based on feedback from participating teachers. By the end of 1991, Eco-Inquiry had been piloted in all Dutchess County school districts as well as in two school districts in the Bronx, N.Y. Also in that year, Ms. Hogan and Dr. Alan Berkowitz, IES head of education, received a grant from the National Science Foundation enabling dissemination of Eco-Inquiry throughout the United States. In February 1992, the Eco-Inquiry National Dissemination Team, comprising science center educators and teachers from around the U.S., met at the Institute to begin the dissemination process. And in June 1994, Eco-Inquiry was published in book form.

Eco-Inquiry: A Guide to Ecological Learning Experiences for the Upper Elementary/Middle Grades is now available from its publishers, the Kendall/Hunt Publishing Company*. The book

Teachers who participated in the pilot programs call Eco-Inquiry a "whole science" curriculum because it makes hands-on science part of a multi-dimensional learning experience. The modules focus on food webs, decomposition and nutrient cycling ... concepts vital to an understanding of how ecosystems work. While doing the projects detailed in "Who Eats What?", "Decomposer Dynamics" and "Cycles — From Rot to Radishes", students learn to do science as scientists do. Working in teams with other students they plan and carry out investigations, complete peer reviews and share their ideas and findings. All the while, they are learning ecology, discovering how to think creatively and critically, experiencing the importance of collaboration, and mastering writing and math skills.

Nationwide dissemination of Eco-Inquiry began two years ago, using an earlier version of the curriculum. Students in fifteen states already are benefiting from this innovative science education program, and, with publication of the book, dissemination will proceed even more rapidly. This summer, Ms. Hogan worked with Eco-Inquiry teachers in St. Louis and Atlanta, and in the Hunter/Tannersville and Windham School Districts in New York's Catskill Mountains. This fall, IES educa-

tors will lead workshops for teachers in Arizona, Michigan and Oregon.

Much of the dissemination process is being done by teachers themselves. In late June, 27 teachers, school science coordinators and environmental educators, primarily from New York state, attended an Eco-Inquiry Leadership Institute to learn how to become "curriculum leaders". Led by Ms. Hogan and Eco-Inquiry project coordinator Ms. Lisa Morganstern, with workshop sessions led by IES scientists Drs. Richard Ostfeld and Richard Pouyat, the three-day institute prepared participants to offer workshops for teachers in their own regions during the coming school year. The potential exists for over 300 new teachers of Eco-Inquiry resulting from this one workshop alone.

What is the future of the Eco-Inquiry dissemination process? While the book's publisher will be marketing the curriculum to a national audience, Institute staff will continue to make informational presentations at meetings around the country. Eco-Inquiry staff also will lead intensive staff development workshops to help educators learn to use Eco-Inquiry's innovative strategies to their maximum potential.

"I think this is the best curriculum I have ever seen to integrate a subject, detail, motivation, teaching theory, techniques, workplace skills, resources, student responsibility, cooperative work, everything in ONE package. WOW!! WELL DONE!!" wrote Dr. Betty J. Eidemiller, a professor at Lamar University in Orange, Texas when she was introduced to the Eco-Inquiry guide at a meeting in July. Schools across the country adopting Eco-Inquiry will have the chance to hear similar reactions from their teachers.

* *Eco-Inquiry: A Guide to Ecological Learning Experiences for the Upper Elementary/Middle Grades*, ISBN: 0-8403-9584-1, Cost: \$36.95; available from: Kendall/Hunt Publishing Co., 4050 Westmark Drive, Dubuque, Iowa 52002. Telephone: 800/228-0810

IES Bike-to-Work-Week

Late May witnessed the Institute's first participation in National Bicycling Month with its own Bike-to-Work-Week (BTWW). IES employees were encouraged to try one or more bicycle commutes during the week of 23 May. Riders kept track of their mileage, and the Institute provided a pizza lunch for all participants at week's end.

Participation was good, especially for a first-time event. Fourteen people turned in records of biking during the week, and as

many as 15 others also participated; several rode nearly every day, despite their busy schedules and the threat of rain.

BTWW was good not only for the riders' health and fitness but also for the environment. A conservative estimate of total miles ridden was 388 miles. At approximately 35 Calories (Cal) expended per bicyclist-mile (Lowe, 1990), this represented 13,584 bicycling Cal. Automobile energy consumption for the same mileage is estimated at

19.4 gallons (at 20 miles per gallon), or 721,866 Cal (1,860 Cal per car-mile; Lowe, 1990). Institute BTWW organizers Dr. Karin Limburg and Mr. Ray Winchcombe estimate that IES riders reduced the output of CO₂ to the atmosphere by 142 kilograms, as well. Pizza-powered bicycling (or bicycling powered by any food, for that matter) clearly is more efficient, and less polluting, than driving.

BTWW raised consciousness about biking

Science on the Verge: Cary Fellow Studies Forest Edges

Ecologists recognize that forest edges — the areas between field and forest and extending a short distance into both — can be likened to delicate membranes that separate parts of the landscape. They know, too, that edges have specific temperature, light and moisture conditions, and a special assemblage of plants and animals living there. Human activity is one of the most significant influences on the creation of edges in contemporary landscapes. By cutting trees and creating new edges, humans disrupt native forests. This disturbance, in turn, invites invasion by exotic plants and animals that may have a negative influence on the native species.

The relevance of the ecology of edges was first recognized in tropical forests, where the destruction of trees wreaked havoc on edge ecosystems. Ecologists now realize the importance of developing an understanding of other forest edges, to increase knowledge about how human activities are affecting the landscape and its living community. It is this research that 1994 Cary Summer Fellow Dr. Ramiro Bustamante is doing during a three-month stay at the Institute.

Dr. Bustamante is an ecologist on the Faculty of Sciences at the University of Chile in Santiago. When he arrived at the Institute in June, he selected edge sites for study at three locations — near the greenhouse, on one of the Cannoo Hills, and near the Gifford House alongside one of the nature trails — and set up transects extending 100 meters (328 feet) from the edge into the forest interior and 15-m (49 ft.) from the edge into the open field. His objective is to learn more about the dynamics of forest patches, to see if they are growing or shrinking, or are in a steady state. Along these 115 meter-long transects he is collecting data to help evaluate the effects of seed predation on the stability of forest patches.

Natural regeneration of forests occurs primarily by successful seed sprouting and growth. When studying the dynamics of

forest patches, then, seed predation by birds, small mammals and other animals is especially relevant. Dr. Bustamante is planting seeds of four tree species — *Acer rubrum* (red maple), *Quercus rubra* (northern red oak), *Prunus serotina* (black cherry) and *Ailanthus altissima* (ailanthus, or tree-of-heaven) — along the 115 meter-long transects at his research sites, and measuring seed predation over a two-week period. (At that point, he will remove all remaining experimental plantings so as not to change normal growth patterns along the forest edges.)

Before doing the seed predation experiments, Dr. Bustamante set up a transect to learn about the abiotic environment of the forest edge. At 5-m (16 ft.) intervals, he first measured temperature changes with thermometers that record the daily minimum and maximum. He is measuring soil humidity, soil temperature, relative humidity and solar radiation at each point as well, and also is studying the response of vegetation to edges by measuring seedling abundance.

In Chile, edges often separate native forests from exotic plantations where trees are grown for commercial harvest. *Pinus radiata* (the Monterey pine) is one such tree. With efficient dispersal and rapidly growing seedlings, it is invading the native forests. When he returns to Santiago, Dr. Bustamante hopes to apply findings from his edge research at the Institute to undesirable invasions by exotic species in Chilean forests.

* * * * *

The Cary Summer Fellowship is an annual award enabling visiting scientists to do research at the Institute. Funds for the



Dr. Ramiro Bustamante, 1994 Cary Fellow, studies the environmentally sensitive edges where forests and fields meet.

award are provided by the Mary Flagler Cary Charitable Trust, and enable Cary Fellows to pursue intensive studies, free from academic responsibilities. The scientists' work contributes to the Institute's program as well as to their own ongoing teaching and/or research programs. Dr. Bustamante is the Institute's 18th Cary Fellow.

In addition to doing research at the University of Chile, Dr. Bustamante teaches ecology and environmental science to primary and high school teachers. While at the Institute he met with Dr. Alan Berkowitz, IES head of education, and Ms. Kathleen Hogan (see page 2) to learn about their work in the field of ecology education.

at IES. The organizers hope that more people will try an occasional bike ride to run an errand, go to work or just have fun.

Reference: Lowe, M.D. 1990. "Pedaling into the Future". In *State of the World 1990*, WorldWatch Institute, Washington, D.C.

IES BTWW bikers included, l. to r.: Joe Warner, Kathie Weathers, David Fischer, Gay Hanson, Joe Boyer, Peter Groffman, Alan Berkowitz, Catherine Corey, Jill Cadwallader and BTWW organizers Karin Limburg & Ray Winchcombe.



Calendar

CONTINUING EDUCATION

Fall semester catalogues are available from the Gifford House. Among the 43 courses, workshops and excursions offered are:

Landscape Design

Sept. 19 (8 sessions): **Principles of Landscape Design**

Sept. 19 (6 sessions): **Ecological Landscape Design: Successful Design with Native Plants**
Oct. 2: **Residential Landscape Design Clinic**

Gardening

Sept. 17 (6 sessions): **Plants for the Landscape: Herbaceous Perennials**

Oct. 2: **Reflections of Nature: Japanese Stone Concepts for the American Garden**

Oct. 15: **Introduction to Orchids**

Natural Science Illustration

Sept. 22 (6 sessions): **Drawing I**

Nov. 5 and/or Nov. 6: **Drawing in the Greenhouse**
Biology and Earth Science

Sept. 17 (4 sessions): **Tree & Shrub Identification**

Sept. 24: **Walking on Water: An Aquifer Experience**

Oct. 1: **Mammals in Your Schoolyard and Beyond: A Course for Elementary School Teachers**

Oct. 16 (4 sessions): **Plant Communities and Indicators**

Workshops

Sept. 24: **Pond Management and Restoration**

Nov. 5: **Careers in Horticulture**

Ecological Excursions and Garden Tours

Sept. 10: **Wetland Ecology from a Canoe**

Oct. 1: **Noah's Garden: An Ecological Model for Transforming the Suburban Landscape**

Oct. 5: **Caprilands Herb Farm**

Natural Crafts

Oct. 1: **Wicker Basket with Dried Flowers**

Oct. 29: **Grapevine and Bittersweet Wreath**

The IES Continuing Education Program office has a new telephone number. Call 914/677-9643 for information on certificate programs or individual offerings, or to register.

For general information, call the IES Education Program Office at the Gifford House Visitor and Education Center: 914/677-5359 weekdays from 8:30 - 4:30.

SUNDAY ECOLOGY PROGRAMS

Free public programs are held on the first and third Sunday of each month, except over holiday weekends. Programs begin at 2 p.m. at the Gifford House on Route 44A unless otherwise noted. Last-minute schedule changes are sometimes unavoidable, so call 914/677-5359 to confirm the day's topic:

Sept. 4: *Labor Day weekend — no program*

Sept. 17: *Call the number above for information*

Oct. 2: **The Community in Transition: Fall in the Fields**, a walk led by Dr. Steward Pickett

Oct. 16: **Field Tour of the Property and Selected Ecological Research Projects**, a walk led by Mr. Raymond Winchcombe

Nov. 6: **Tour of the Institute's Laboratories**, led by Dr. Kathleen Weathers

• *In case of poor weather, call 677-5358 after 1 p.m. to learn the status of the day's program. For outdoor programs, wear long pants tucked into socks and sturdy waterproof shoes.*

IES SEMINARS

The Institute's program of scientific seminars features presentations by visiting scientists. Beginning in mid-September, free seminars are held each Friday at 3:30 p.m. at the Plant Science Building.

Sept. 16: **When Does a Disturbance Matter?**

Catastrophic Natural Perturbations and Invisible Human Perturbations in a New England Forest, by Dr. Richard Bowden, Allegheny College

Sept. 23: **Sphagna as Environmental Manipulators**, by Dr. Nico van Breemen, Agricultural University, The Netherlands

Sept. 30: **Groundwater/Surface Water Interactions in Streams**, by Dr. Clifford N. Dahm, Univ. of New Mexico

Oct. 7: **Impact of Pathogens on Spatial Patterns of Seedling Recruitment in Tropical Forests**, by Dr. Carol K. Augspurger, Univ. of Illinois-Urbana

Oct. 14: **Topic: Vole behavior**, by Dr. Betty McGuire, Univ. of Massachusetts

Oct. 21: **Speaker: Dr. Paul A. Keddy**, Univ. of Ottawa

GREENHOUSE

The IES greenhouse is a year-round tropical plant paradise as well as a site for controlled environmental research. The greenhouse is open until 4:00 p.m. daily except public holidays. Admission is by free permit from the Gifford House.

IES GIFT AND PLANT SHOP

New in the Shop!! Gardening books by IES instructors: *Waterscaping*, by Judy Glattstein; *The Perennial Garden* (paperback), by Fred McGourty; *Perennial Gardening*, by Mike Ruggiero ...

For children: "Garbage" Gardens; pond, stream, meadow and forest puzzles; *Look Closer* books

Fall Perennial Sale: Saturday, October 1, 10 a.m. - 3 p.m. — divisions from the IES display gardens

Senior Citizens Days: On Wednesdays, senior citizens receive a 10% discount (except sale items).

HOURS

Summer hours: May 1 - September 30

Closed on public holidays.

Public attractions are open Mon. - Sat., 9 a.m. - 6 p.m. & Sun. 1 - 6 p.m. (Note: The Greenhouse and Plant Science Building close at 4 p.m.)

The **IES Gift and Plant Shop** is open Mon. - Sat., 11 a.m. - 5 p.m. & Sun. 1 - 5 p.m. (The shop is closed weekdays from 1 - 1:30 p.m.)

• *All visitors must pick up a free permit at the Gifford House Visitor and Education Center on Route 44A for access to IES public attractions. Permits are available until 5:00 p.m. daily.*

MEMBERSHIP

Become a member of the Institute of Ecosystem Studies. Benefits include a member's rate for IES courses and excursions, a 10% discount on Gift Shop purchases, a free subscription to the IES Newsletter, and participation in a reciprocal admissions program, with benefits at over 100 nature centers, forest preserves, gardens and conservatories in the U.S. and Canada. Individual membership is \$30; family membership is \$40. For information on memberships, call Ms. Janice Claiborne at 914/677-5343.

INSTITUTE OF
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Education Program

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